

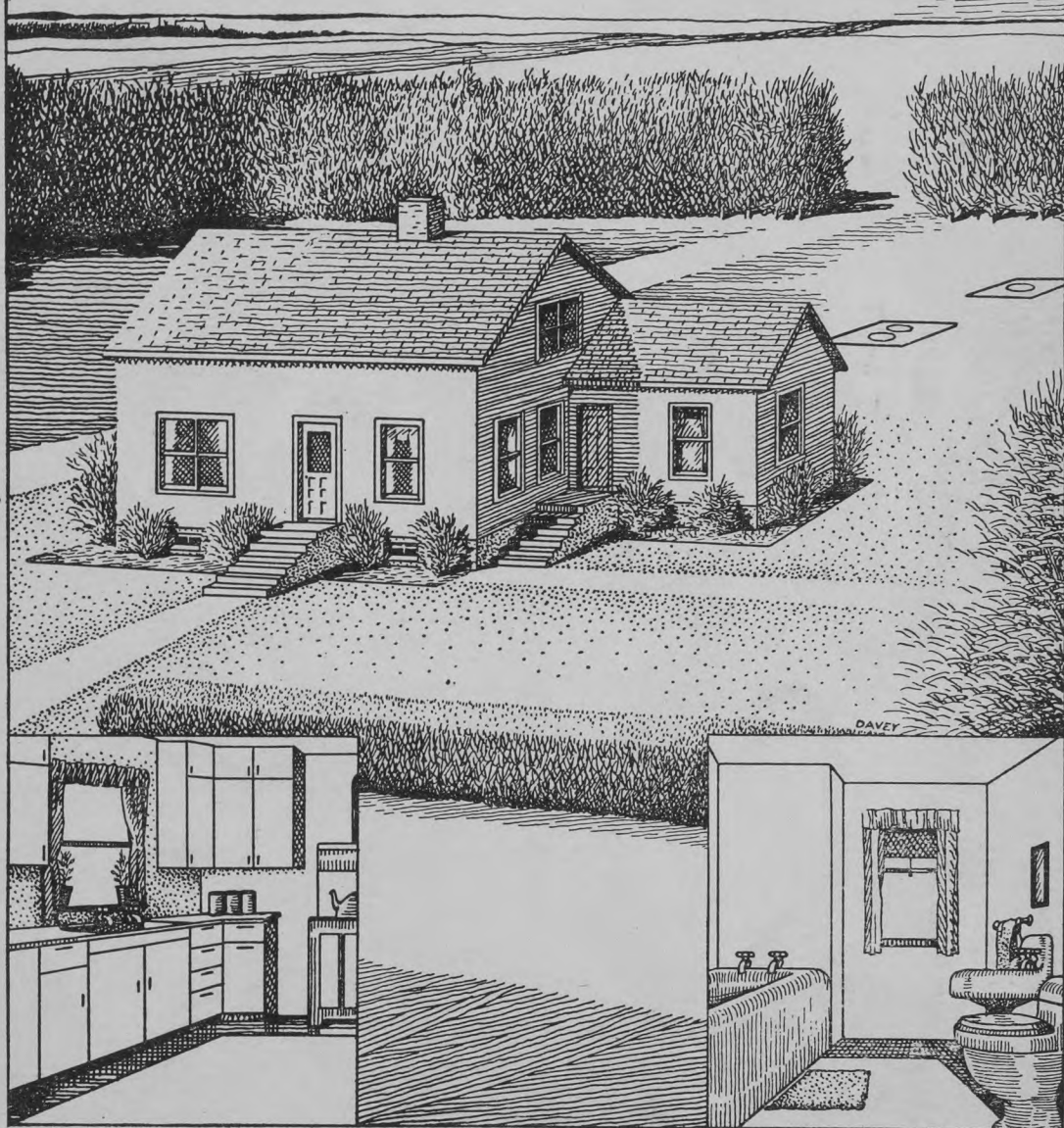
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# Modernizing FARM HOMES

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DEPARTMENT OF RECONSTRUCTION AND REHABILITATION

# *Modernizing Farm Homes*

## *Water Supply and Sewage Disposal*

*Published by the Authority of*  
HONOURABLE JOHN H. STURDY,  
Minister of Reconstruction and Rehabilitation

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## *Foreword*

*As a further contribution towards assisting farmers and other rural residents to achieve a higher standard of comfort and convenience this bulletin on "Modernizing Farm Homes" is being published. It is the work of the Farm Housing Committee and is one of a series of publications dealing with improved living standards in rural areas. It is offered as a companion volume to "A Guide to Farm Home Planning and Modernization".*

JOHN H. STURDY,

Minister of Reconstruction  
and Rehabilitation.

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## *Contents*

	Page
Introduction .....	7
Power Requirements .....	8
The Hydraulic Ram .....	10
Well Pumps .....	10
Storage Tanks .....	12
Hard and Soft Water .....	16
Cisterns .....	16
Water Softening System .....	16
Plumbing and Sewage Disposal .....	17



# MODERNIZING FARM HOMES

## WATER SUPPLY AND SEWAGE DISPOSAL

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### Introduction

With comparatively few exceptions, farm homes in the Province of Saskatchewan offer little or none of the conveniences of urban homes. It is true that our pioneers and early settlers had many, and probably more important things to consider, with the result that home comforts were given scant attention. However, we have now passed the pioneering stage, and there is no reason why more consideration should not be given to the problem of bringing city conveniences to the farm. This bulletin has been prepared in the hope that it will encourage the improvement of farm sanitation and healthful living, as well as providing general information for those who contemplate modernizing their home.

The first problem of course is water supply. There are two possible sources, surface, and sub-surface or underground. Unfortunately, much of the sub-surface water in this Province is highly mineralized. We usually refer to it as alkali water. However, the alkali content is of minor importance. It is the sulphate which predominates and is the most troublesome salt. It is not an alkali. Water high in sulphate cannot be economically treated by any known method, and no highly mineralized water will improve as time goes on. In fact, the reverse is more likely to be true. Therefore, no encouragement can be given to the possible treatment or improvement of such water. Usually, although not always, the deeper the well the more mineral salt is likely to be present in the water. Surface supplies other than salt lakes, are usually low in mineral salt and thus are comparatively soft. Few farmers are fortunate enough to find adequate natural surface water on their farms. As an alternative it is suggested that use be made of dugouts, many of which are being built annually. Dugout supplies are quite satisfactory if certain construction and operation requirements are observed.

Full information relative to dugout supplies, and the construction of wells, is contained in the bulletin entitled "Safe Water Supplies", issued by the Department of Public Health. This bulletin may be obtained upon request. Likewise, water samples will be analyzed by the Department free of charge, but samples must be submitted in special containers which are supplied by the Department. All correspondence should be addressed to the Division of Sanitation, Department of Public Health, Regina.

The average quantity of water used by each person daily varies greatly. When water under pressure is available the amount will be considerably higher than otherwise. However, for ordinary domestic purposes on the farm, fifteen gallons per person per day is a fairly close estimate. This includes laundry and cooking and dishwashing water.

The daily amount of water required by live stock and fowl also varies considerably, especially from season to season. A reasonable figure is eight gallons for horses, ten gallons for cows, one gallon for sheep and hogs and three gallons per 100 chickens.

After securing a suitable supply, the next problem is to convey the water to the point where it is to be used. The method of doing so will depend on several factors. If, for example, a water supply can be obtained in a location considerably higher than the house or farm buildings, then a pipe line connection may be all that is necessary. It must be remembered, however, that to furnish a constant supply to plumbing fixtures requires water storage of some kind, even if storage is not needed to provide pressure.

Except perhaps, in the rare instances of a spring issuing from a point considerably higher than the house, a pump of some kind is the first requisite. Pumps are readily available under normal conditions, but the power to operate them is not a simple matter. The ideal power, of course, is electrical energy, and where such power is available an electric motor will solve the problem. Furthermore, electric power permits automatic control of the pumping. Alternatives to electrical power are gasoline driven or other internal combustion engines, hand operated force pumps, possibly windmills, and, under certain local conditions, hydraulic rams.

### **Power Requirements**

The horse-power or energy required to pump water depends on the rate at which the water is delivered and the total height or level to which it must be raised. The total height (or head) consists of the distance from the water surface at the time of pumping, to the pump level, plus the vertical distance from the pump to the top of the storage tank, or the pressure against which the water must be pumped. The height or head may be expressed in feet or in pounds pressure per square inch. A column of water one foot high exerts a pressure of 0.433 pounds per square inch, and one pound per square inch pressure represents a column of water 2.3 feet high. A gallon of water weighs ten pounds. There are six and one-quarter gallons of water in one cubic foot and one cubic foot of water therefore weighs sixty-two and one-half pounds.

In addition to the total height or head there is also the factor of friction head or friction loss in pipe lines. Water flowing through a pipe or conduit is held back to some extent by the friction along the sides of the pipe or the conduit. Additional power or energy is required to overcome the friction, and this value must be added to the total head. The amount of the friction head depends on the diameter and length of pipe for any given rate of pumping or water delivery, and on the kind of material. The smoother the pipe or conduit the less friction loss occurs. Table 1 gives friction head in feet per 100 feet of pipe for various quantities of water flowing through pipes of different diameters.

TABLE 1.—FRICTION LOSS (Head Loss) PER 100 FEET OF PIPE.

Imp. Gals. per Minute	Inside Diameter of Pipe				
	½" pipe	¾" pipe	1" pipe	1½" pipe	2" pipe
2	6.90 ft.	1.85 ft.	—	—	—
3	13.80 ft.	3.70 ft.	1.15 ft.	—	—
4	25.30 ft.	6.00 ft.	1.95 ft.	0.30 ft.	—
5	—	9.65 ft.	3.20 ft.	0.40 ft.	0.10 ft.
10	—	—	10.35 ft.	1.25 ft.	0.30 ft.

This table is based on fairly smooth wrought iron or similar pipe.

A study of the above table shows clearly that much energy is required to overcome friction, especially in the case of small diameter pipes and relatively large flows.

Pipe sizes should be chosen which give the minimum friction loss consistent with economy of materials and power costs.

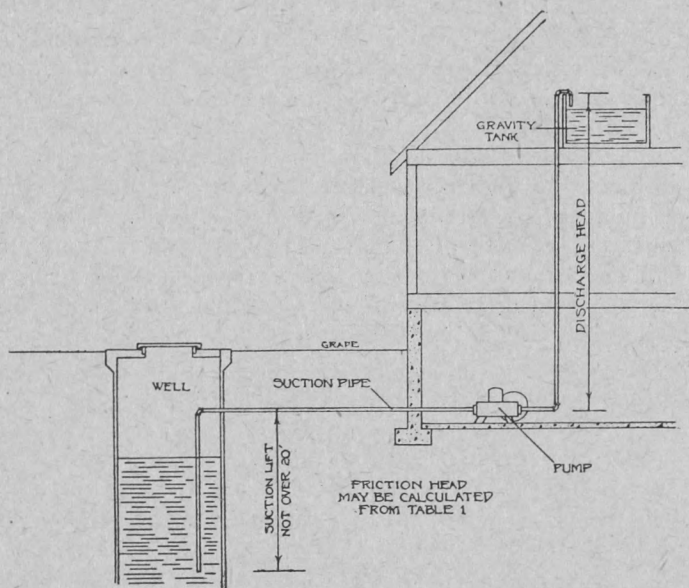


FIGURE 1.—Pump, well, and storage tank, showing suction lift, and discharge head. The friction head may be calculated by referring to Table 1.

After the total head, including friction head, has been ascertained, and the rate of pumping or delivery of water is decided upon, the theoretical horse-power can be determined. This is done by taking the amount of water in pounds to be pumped or delivered per unit of time (usually per minute), multiplying this figure by the total head and dividing the product by 33000 if the time unit is in minutes. For example, suppose 10 gallons of water per minute are to be pumped against a total head of 100 feet. The theoretical horse-power is:

$$10 \text{ gals.} \times 10 \text{ (lbs. per gal.)} \times 100 \text{ ft. (head)} = 0.3 \text{ h.p.} = \text{about } \frac{1}{3} \text{ h.p.}$$

33000

The theoretical horse-power is based on 100 per cent. efficiency, but pumping units are never perfectly efficient. A good efficiency for a centrifugal pump, direct connected to an electric motor, is only about 70 per cent. It is advisable to leave this problem to the manufacturer or dealer from whom the equipment is obtained.

Horse-power may be converted into electrical energy by applying the following table:

$$\begin{array}{rcl} 1 \text{ horse power} & = & 746 \text{ watts} \\ 1000 \text{ watts} & = & 1 \text{ kilowatt} \end{array}$$

If power costs 10 cents per kilowatt the cost of operating a one horse-power motor for one hour is:

$$1 \text{ h.p.} = 746 \text{ watts} = \frac{746}{1000} \text{ kilowatts} = \frac{746 \times 10c}{1000} = 7\frac{1}{2}c \text{ (approximately) per hour}$$

## The Hydraulic Ram

The hydraulic ram, Figure 2, utilizes the momentum of water flowing down an incline to raise a part of that water to an elevation several times as high as the fall used to operate the ram. It is simple in design and operation, and if properly installed will continue to operate 24 hours a day with little or no attention so long as the supply of water remains adequate. A flowing well or spring may be used as a source of power for pumping by means of an hydraulic ram. The necessary requirements are a constant supply of water with a minimum flow of two gallons per minute and a fall of not less than two feet and facilities for draining the waste water away from the ram. Where these conditions do not exist, an hydraulic ram cannot be used.

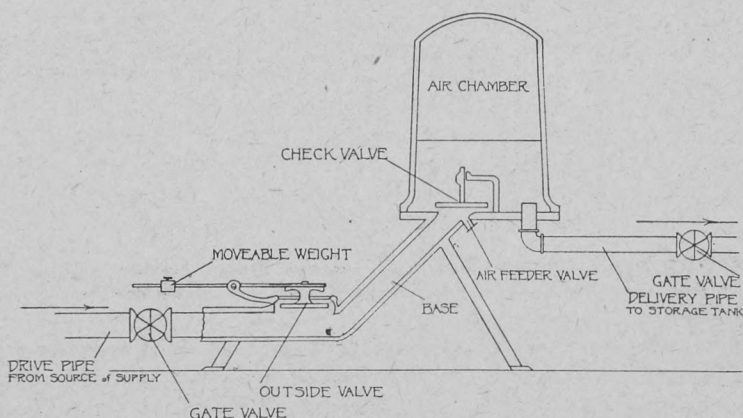


FIGURE 2.—An hydraulic ram.

## Well Pumps

There are numerous types of well pumps available, and the particular type chosen depends on local conditions, such as depth of well, capacity of well, power available, etc. The following table lists the common sizes of pump cylinders for various depths (page 11).

Pumps may be operated by hand, by gasoline engines or by electric motors. For slow pumping, a windmill may be found reasonably satisfactory, providing there is ample storage capacity available. The approximate capacity of windmills is shown in Table 3.

TABLE 2

Cylinder		Well Equipment Specifications			
Size	Stroke	Capacity Imp. Gal. per hr.	Size of Pipe		Depth of Well
			Shallow	Deep	
2"	6"	163	1¼"	2"	50'-200'
2½"	6"	250	1¼"	2½"	25'-150'
3"	6"	370	1¼"	3"	25'-75'
3½"	6"	500	1¼-1½"	—	25'-50'
4"	6"	650	1½-2"	—	35' or less
5"	6"	1020	2-2½"	—	25' or less

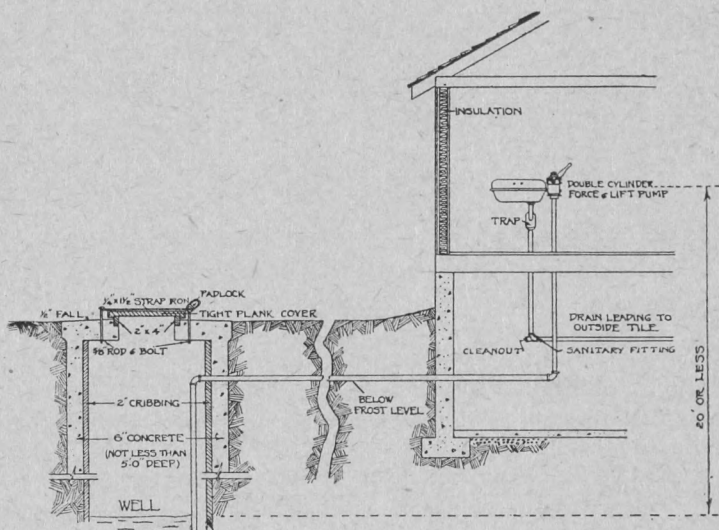
TABLE 3

Approximate capacity of windmills (from manufacturers' ratings.)

Lift		Diameter of Wheels					
		6 feet		8 feet		10 feet	
		Diam- eter of cylinder	Capacity per hour	Diam- eter of cylinder	Capacity per hour	Diam- eter of cylinder	Capacity per hour
Feet	Miles	Inches	Gallons	Inches	Gallons	Inches	Gallons
25	10	2½	140	3½	320	4¼	420
35	10	2	120	3	270	4	360
50	10	1¾	110	2¾	180	3½	305
75	10	—	—	2½	135	3	235
100	10	—	—	2	105	2½	160
125	10	—	—	1¾	90	2	125
25	15	3½	250	5	560	7	1190
35	15	3	175	4	400	6	880
50	15	2½	125	3½	280	5	610
75	15	2	85	2¾	190	4	375
100	15	1⅞	60	2½	140	3½	305
125	15	—	—	2¼	115	3¼	250

As pipe lines must be buried seven to nine feet for frost protection, either the pump must be set in a chamber below ground or if at the ground surface it must be suitably housed and the discharge pipe must be carried vertically downward to the frost protected level before it is extended horizontally to the house. If a gasoline or other internal combustion engine is used for power on a pump set below ground, adequate precautions must be taken to provide good ventilation, otherwise asphyxiation of the operator may result. If the water is taken from a well adjacent to or in a basement of the house or from an underground

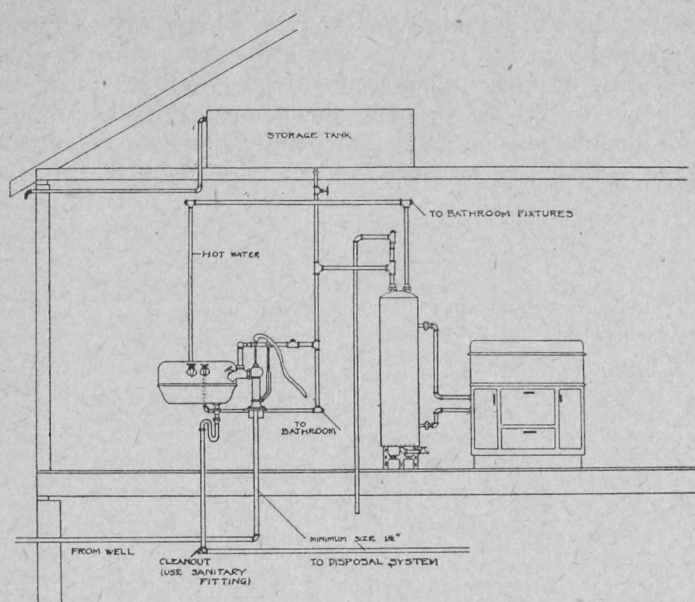
reservoir then the ordinary plunger type force pump may be used and located in the house so long as the total suction lift does not exceed 20 feet and preferably 18 feet. See Figure 3. This arrangement is quite satisfactory where only one or two plumbing fixtures are installed, such as a kitchen sink and bathtub, as shown in Figure 4. A hand operated pump may be used in connection with a pneumatic pressure tank as well as with an overhead gravity tank.



**FIGURE 3.**—Shallow well with pump conveniently located inside the house. Such an installation is satisfactory if the water does not have to be lifted higher than twenty feet.

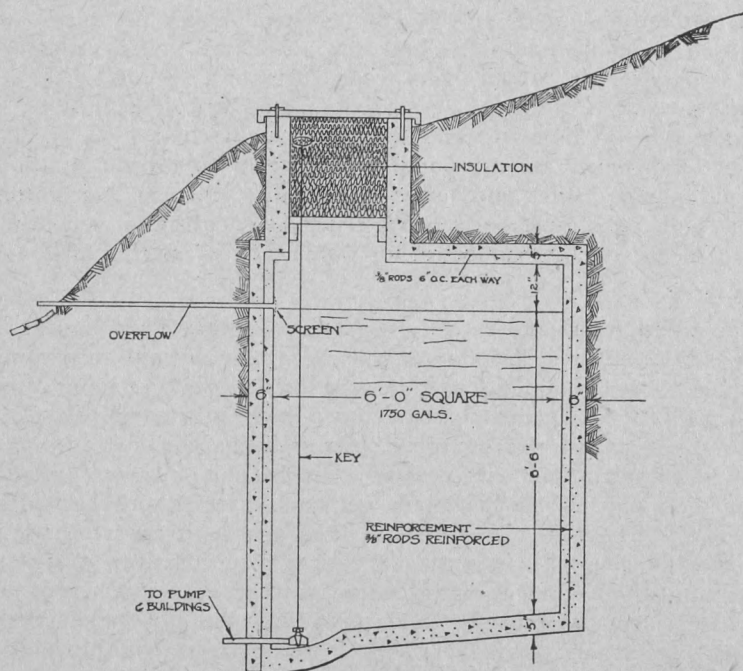
## Storage Tanks

A gravity or elevated storage tank provides cheap storage for a large quantity of water under low pressure, but it must be protected against freezing and provision must be made for an overflow. During warm weather moisture from the air will condense on the outside of a tank if it is installed in the attic of a house, and the drip must be caught and drained away, otherwise damage to the house will follow. An elevated tank must be well supported, as 200 gallons of water weigh a ton. The upper ceiling of the average house is not built to withstand heavy loading. Therefore only a small storage tank at best can be located in the house. See Figure 4.



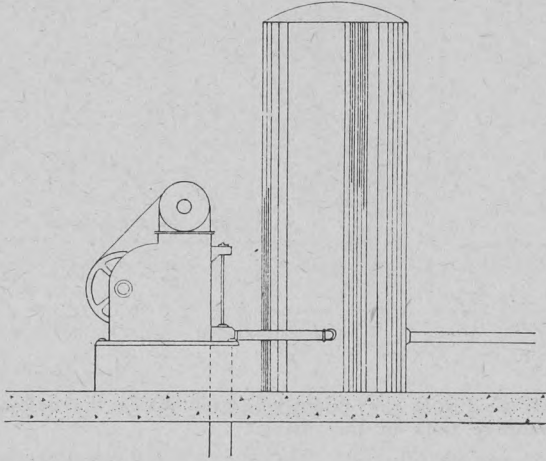
**FIGURE 4.—Pump conveniently located inside the house, hot water tank, and storage tank in the attic.**

In those locations where a hill or rise of ground occurs reasonably close to the house or well, an underground storage tank as shown in Figure 5 will be found both economical and satisfactory. Furthermore, the water will remain cool in hot weather.



**FIGURE 5.—An underground storage tank.**

Pneumatic tanks are ideal for storage where there is a plentiful water supply and electric power is available. The tank may be placed in the basement or in a utility room. If the well or water supply is near the house or in the basement the pump and tank can be placed together or mounted as one unit. The pump motor may be automatically controlled by a float or a pressure switch.



**FIGURE 6.—Pump and pneumatic tank. Either hand operated, motor or engine driven pumps may be used.**

In a pneumatic system, the water is stored in an air-tight tank and forced through the pipes of the water system by air pressure. When water is first pumped into the tank the air in the tank is compressed. This compressed air supplies the needed pressure. Some of the air in the storage tank is absorbed by the water and provision must be made to replace it from time to time. This is usually done by a special air cylinder arrangement on the pump or by means of an air intake valve and hand pump. Inlet and outlet pipes must enter at the bottom of the tank and tanks must be well constructed to withstand working pressures. The usual range boiler or hot water tank is entirely unsuited for the purpose.

The pump supplying water to a pressure storage tank may be operated by hand, or by a gasoline engine, a ram or by an electric motor. Windmills are not commonly used because of their low pumping capacity, and uncertainty of operation, requiring a large storage capacity. The pneumatic system differs from other systems in that air, instead of water, is held in storage. For that reason frequent pumping is required and that explains why an electric motor with automatic control provides the ideal power. The air in the pressure tank acts as a cushion and when water is withdrawn the air expands with a resulting drop of pressure. With continued withdrawal of water the pressure will drop to zero unless more water is pumped to the tank to again compress the air cushion. For best performance the tank should carry about one-third air and two-thirds water at a maximum operating pressure. Likewise, there

should be an initial air pressure, that is, enough air to give pressure when no water is in the tank. Table 4 shows what percentage or fractional part of any tank contains water under varying conditions or gauge pressure, and initial air pressure.

TABLE 4.—QUANTITY OF WATER IN FRACTIONAL PART OF  
TOTAL CAPACITY OF ANY HYDROPNEUMATIC TANK.

(Based on atmospheric pressure of 14.7 pounds per square inch.)

Gauge Pressure (lbs.)	Initial Pressure in Pounds					
	0	5	10	15	20	25
5	0.25	—	—	—	—	—
10	.40	0.20	—	—	—	—
15	.51	.34	0.17	—	—	—
20	.58	.43	.29	0.14	—	—
25	.63	.50	.38	.25	0.13	—
30	.67	.56	.45	.34	.22	0.11
35	.70	.60	.50	.40	.30	.20
40	.73	.64	.55	.46	.37	.27
45	0.75	0.67	0.59	0.50	0.42	0.34
50	.77	.70	.62	.54	.46	.39
55	.79	.72	.65	.57	.50	.43
60	.80	.74	.67	.60	.54	.47
65	.82	.75	.69	.63	.56	.50
70	.83	.77	.71	.65	.59	.53
75	.84	.78	.72	.67	.61	.56
80	.85	.79	.74	.69	.63	.58

The above table shows that if water is pumped into a tank having no (initial) pressure above that of the atmosphere until the gauge pressure is 5 pounds, then the tank will be one-fourth (0.25) filled with water. At 15 pounds gauge pressure it will be about one-half (0.51) full. At 30 pounds, two-thirds (0.67) full, and so on. This table also shows the amount of water which may be withdrawn before a desired minimum pressure is reached. Take for example a 200-gallon tank. If there is no initial pressure the tank will be about three-quarters (0.73) full of water when the gauge reads 40 pounds. Three-quarters of 200 is 150 gallons. When water is withdrawn until the gauge reads 15 pounds the tank is approximately one-half full. One half of 200 equals 100 gallons. In other words, 50 gallons may be withdrawn before the pressure drops to 15 pounds. If, on the other hand, the initial air pressure is 10 pounds, then the tank is only a little over half (0.55) full at a gauge pressure of 40 pounds. 0.55 of 200 is 110 gallons. When the pressure drops to 15 pounds the water occupies 0.17 per cent. of the tank, or 0.17 per cent. of 200 which is 34 gallons. Therefore the difference between 110 gallons and 34 gallons, 76 gallons, may be withdrawn before the pressure drops to 15 pounds. It must be remembered, however, that the higher the pressure the greater is the energy required for pumping, and allowance must always be made for the maximum pressure desired.

## Hard and Soft Water

In many rural homes it is desirable to use well water for drinking and cooking purposes, and cistern or rain water for washing and cleaning purposes. This requires a separate pump, separate storage tank and a separate system of pipes. It is customary to heat only the soft water. Therefore, hot and cold soft water lines should be connected to the kitchen sink, the basin in the bathroom and to the bathtub. Since the hard water is not heated, the lines from this system should go to the kitchen sink for drinking and cooking water, and to the water closet of the toilet. Kitchen sinks with openings for three faucets are available.

### Cisterns

In many parts of Saskatchewan it is necessary to depend upon cisterns which are filled periodically with water hauled by team or truck from some more or less distant supply, or, more generally with water from rain or melting snow. In the latter case, the water is collected from the roof of the house and perhaps from other buildings. Records show that about half the precipitation occurs in May, June and July, hence it will be necessary to have a cistern which will hold enough water to last the duration of a dry period. From a 30x26 house, 1600 to 2500 gallons could be collected with a rainfall of 4 to 6 inches. Table 5 will indicate the size of cistern needed to store this much water.

TABLE 5

Diameter of circular cistern in feet	Imperial gallons per foot of depth	Size of rectangular cistern in feet	Imperial gallons per foot of depth
6	175.50	6x8	300.00
7	240.00	6x10	375.00
8	314.17	6x12	450.00
9	379.00	8x8	400.00
10	490.87	8x10	500.00
—	—	8x12	600.00
—	—	10x10	625.00

**EXAMPLE:** A circular cistern 8 feet in diameter and containing 8 feet of water holds 8x314.17 gallons which equals about the amount of water you might expect to collect from a roof of a house 30x26 if 6 inches of rain fell.

### Water Softening System

Where the well water is not excessively hard, and there is an ample supply available under pressure, a water softener of the "zeolite" type can be used. This does away with the cistern or soft water system.

"Zeolite" or similar material under various trade names is an artificial mineral capable of removing the lime and magnesia (hardening salts) from water when it is passed through a bed of the material. The softener consists of a tank filled with the zeolite. The tank is then connected to the water system so that the water passes upward through the zeolite. After a time the zeolite will absorb no more lime or magnesia

and the water coming from the softener will have undergone no change whatsoever. It is then necessary to regenerate the softener with a solution of common salt. In practice the softener is regenerated before the zeolite has lost all of its softening properties. The regulating process is very simple and fully controlled by valves. The amount of water that can be softened between regeneration depends on the hardness of the water and the size of the softener.

Zeolite softening does not improve water for drinking or culinary purposes. No mineral salt is removed. In fact it is usually increased in quantity. Only the hardening or soap destroying salts are affected. These are converted from calcium and magnesium sulphate to sodium sulphate which does not impart hardness. It is usually desirable to place the softener in the water system in such a way that water for drinking, toilet flushes, lawn sprinkling, etc., does not pass through it. This prolongs the period between regenerations of the softener.

A very hard water cannot be economically softened by the zeolite or any other method. Filtering water through sand or gravel does not in any way alter, remove or otherwise change the mineral salt content.

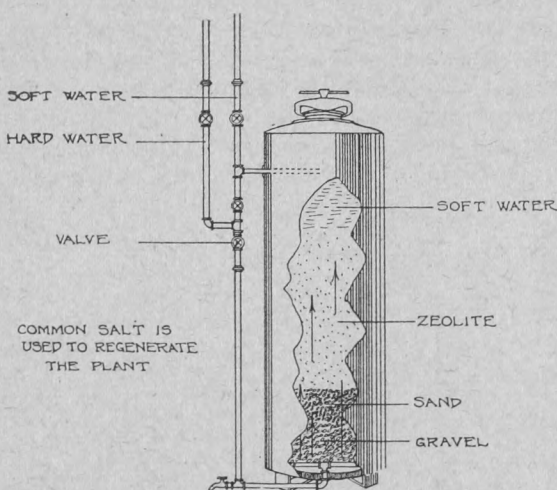


FIGURE 7.—Single tank zeolite water softener.

## Plumbing and Sewage Disposal

Information relative to the construction and operation of sewage disposal systems is contained in the Bulletin No. 1, "Sewage Disposal for Rural Homes in Saskatchewan," prepared by the Department of Public Health. Copies of this bulletin may be obtained upon request from the Division of Sanitation, Department of Public Health, Regina, Saskatchewan.

Although many farmers are quite capable steam fitters or pipe fitters the installation of a plumbing system involves much more than the simple assembly of pipes and fittings. Any person attempting a plumbing installation must have a knowledge of the principles of plumbing, such

as venting, trapping, cleanouts, pipe gradients, connections, materials, etc. Without this knowledge, and at least some previous practical experience it is not likely that a satisfactory or economical installation can be made. For that reason any complete plumbing installation should only be undertaken by an experienced plumber.

Provincial plumbing regulations stipulate that no rural plumbing installation may be made, nor commenced, until a permit has been obtained from the Provincial Health Department. Furthermore, all new plumbing installations are subject to inspection by a representative of the Department and must comply fully with regulations.

In some farm homes it may be desirable to install only a kitchen sink or hand basin as an initial step in modernizing the home. Such work can be undertaken by the average farmer without a plumber's services. Figure 8 shows a view of a kitchen sink with trap and outlet waste pipe. The trap should be of the non-syphoning type unless the fixture is fully vented. The waste pipe must, of course, be extended to a point beyond the house and in such a manner that it will not freeze. It should end in a seepage pit, which is simply a hole in the ground, adequately covered. The walls of the pit may be lined with planking or cased with sheeting so that they will not cave in. The pit must be so located that there is no danger of polluting the well or other source of water supply, and should be at least 50 feet away from it. Almost any soil will, for a time at least, absorb the small quantity of water which is normally discharged from a kitchen sink. However, grease will eventually clog the pores and then a new pit must be constructed.

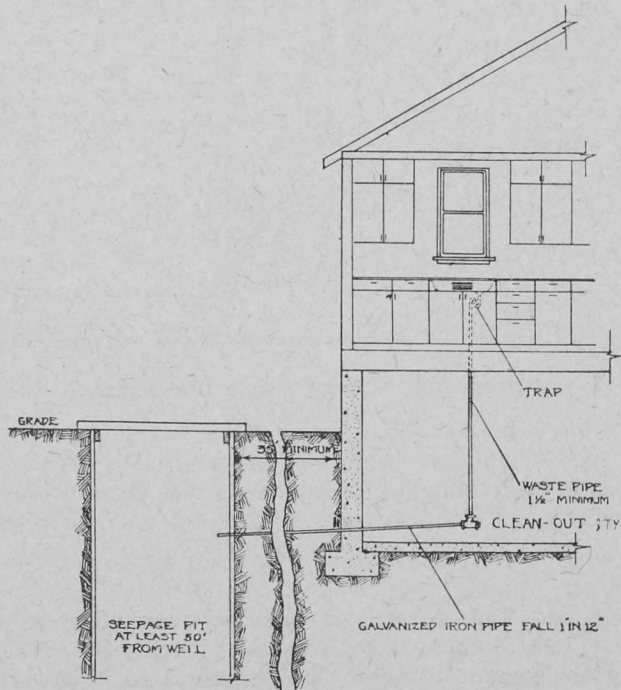
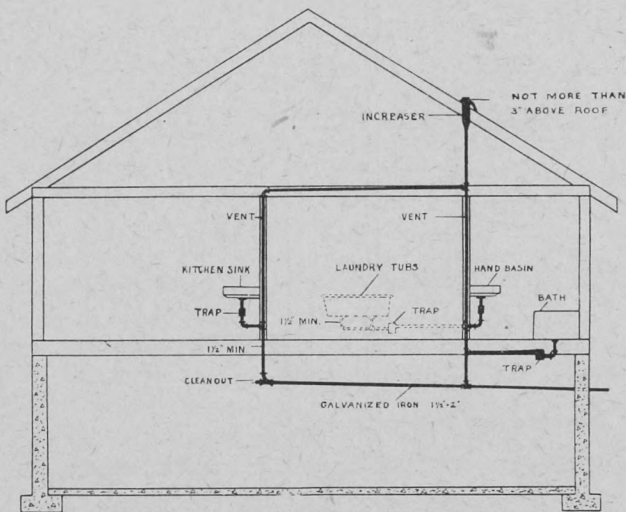


FIGURE 8.—Kitchen sink and seepage pit.

Instead of lining the pit, an alternative method is to fill it with field stone to a point above which no caving in of the side is likely to occur. The stones will not increase the rate of absorption except insofar as grease has a tendency to cling to them and thus reduces the rate of clogging of the sub-soil. Do not attempt to filter the waste through gravel or sand, unless you are prepared to remove and replace such material frequently. In no case will the rate of absorption be increased.

If the plumbing fixtures are to consist of a kitchen sink, a bathtub and basin, then the same type of disposal system may be used except that the seepage pit may have to be renewed at more frequent intervals. The plumbing in the building, however, becomes more complicated especially if there are fixtures on different floor levels or they are a considerable distance apart horizontally.

Almost everyone realizes that traps are used in connection with plumbing fixtures. The purpose of a trap is to provide a water seal at or near the fixture so that obnoxious sewer gases cannot rise up through the fixture and escape into the room or building. Unless a system of venting is provided, the water in the trap may be syphoned out each time the fixture is used or by the flushing of other fixtures. Vent pipes must be carried vertically upward through the roof. They must be a minimum size depending on the number and type of fixtures. To prevent ice forming in, and sealing the outlet end of the vent, the pipe must be increased at the roof and it must not extend more than 3 inches above it. Figure 9 shows a typical three fixture installation.

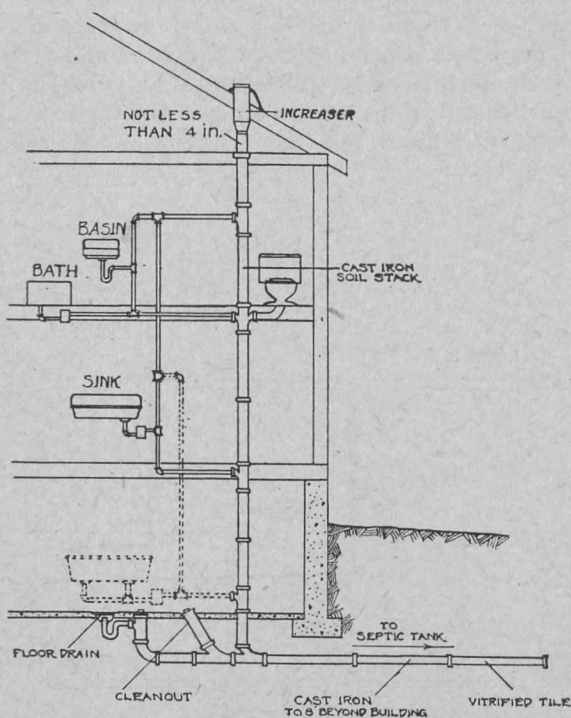


**FIGURE 9.—Three-fixture unit. (Note laundry tubs shown in dotted lines as optional equipment.)**

Where water closets are installed the plumbing system becomes still more complicated, as also does the disposal system. Waste pipes receiving drainage from water closets now become soil pipes and they must

be of cast iron. Likewise the main vent is called a soil stack and all the main piping from the top of the soil stack to the outlet from the building and eight feet beyond that must be of cast iron with leaded joints. Ordinarily the bathroom fixtures in a one-family dwelling can be so arranged that they do not require separate venting. This, however, does not usually apply to the kitchen sink.

If plumbing is installed in a building at the time of construction the placing of soil stacks or of vents is no problem, but when plumbing is added after construction then the matter is not always simple. Floor and roof openings must be cut, and the pipe cannot be concealed in partition walls. This, of course, applies to waste or drainage pipes also but is not so serious. Soil and vent stacks must be as nearly vertical as possible so that the location of fixtures must be carefully considered otherwise the number of roof openings may be increased. These facts are pointed out to ensure that they be given due consideration before proceeding with an installation and thereby probably avoiding excessive costs. Figure 10 shows the essential features of a simple four-fixture installation.



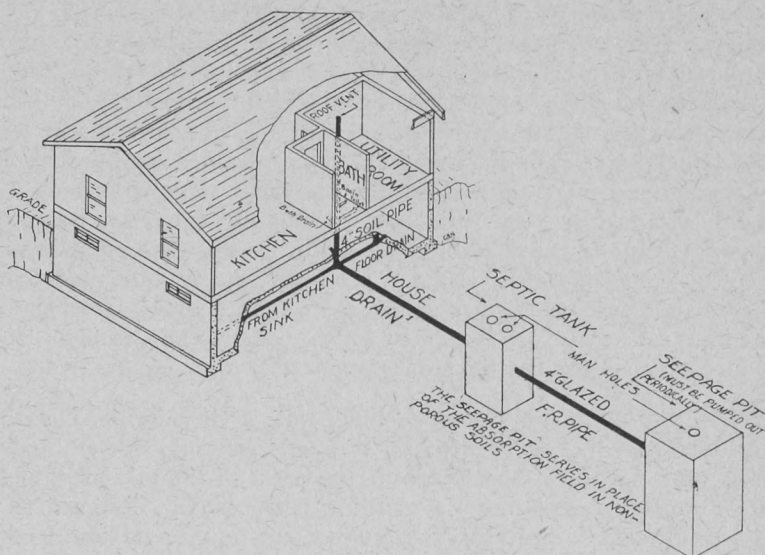
**FIGURE 10.—Four-fixture unit, basement drained and laundry tubs shown dotted-in as additional equipment. (These might more conveniently be placed on the first floor instead of in the basement.)**

It is not essential but often desirable to drain the basement. Basement drainage permits the installation of laundry tubs, a toilet if desired or a shower bath. A basement toilet and shower bath is very convenient for hired help; especially when such help is employed throughout the year. Similar facilities may be placed in a utility room off the kitchen if the room is heated sufficiently to prevent frost damage in the winter months. The main drain, known as the house drain, must be carried out below the ground level and, where the basement is not too deep it can be readily drained at very little cost. Generally speaking, no attempt to drain a deep basement should be made as this will necessitate an excessively deep disposal system. However, many other advantages are found in a basement which is not more than 4 or 4½ feet below the ground surface, and such basements can usually be drained at no additional expense for the disposal system.

Where the plumbing system includes one or more water closets the soakage-pit type of sewage disposal not only becomes useless, even in pervious sub-soils, but its use is an infringement of the provincial plumbing and drainage regulations. A settling tank, usually designed as and called a septic tank is necessary. However, the liquid overflow from the septic tank may be discharged to a separate soakage-pit so long as the sub-soil is porous and there is no danger of polluting the water supply. The distance between the soakage-pit and well must be at least 100 feet. Likewise the soakage-pit must be at least 35 feet from the house, and a greater distance is recommended. Instead of a soakage-pit it may be desirable to use a sub-surface absorption field if local conditions are favourable. Information relative to the construction and operation of absorption fields and septic tanks is contained in the bulletin "Sewage Disposal for Homes in Rural Saskatchewan".

On farms where the buildings are usually isolated from neighbours and where considerable land area is available, it is permissible to pump the liquid from septic tanks or soakage-pits onto the ground surface. The only restriction is that this practice must not endanger the water supply of the owner or his neighbour, or become a nuisance. The ground surface around a tree belt is an ideal area for liquid disposal, but in no case may sewage liquid be used for irrigation of vegetables. Whatever area is used it must be as far away from the house as is possible and a new area should be used if the soil becomes water-logged or ponding of the water occurs. Sprinkling the area occasionally with chloride of lime will help to keep down odours and prevent fly and mosquito breeding. During the winter months ice may form, but that does not matter so long as the water can get away quickly in the spring.

Even if surface disposal is adopted, a septic tank and a liquid storage tank will be necessary. The storage tank need not be water-tight and may be located adjacent to the septic tank or at some distance from it, whichever is most convenient and practical. The capacity of the storage tank should be such that it need not be emptied oftener than about every two weeks or less. The function of the septic tank is to remove settleable solids and permit a certain amount of digestion or liquefaction. It must



**FIGURE 11.—View of a disposal system. Note the seepage pit is used in poorly drained soils, whereas an absorption field may be used in well drained soils.**

be cleaned out periodically, probably once or twice yearly. If it appears to require no cleaning over a period of years it is not functioning as a septic tank. Keep in mind that the liquid from a septic tank is just as obnoxious and dangerous to health as raw sewage.

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